STATE OF COLORADO

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Patricia A Nolan, MD, MPH, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department of Public Health and Environment

000062410

July 1, 1994

Mr Steven W Slaten
U S Department of Energy
Rocky Flats Office
P O Box 928
Golden, Colorado 80402-0928

RE Technical Memorandum/Revised Work Plan - OU7

Dear Mr Slaten,

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division), has reviewed the above referenced document and is providing the attached comments As the lead regulatory agency for OU7, we have assembled consolidated comments and are providing them without editing to DOE Division comments must be addressed in the final submittal Comments submitted by EPA must be addressed to the satisfaction of the Division

The Division has found both the Technical Memorandum portion, containing the results of the Phase I RFI/RI fieldwork, and the Revised Work Plan, proposing field work to satisfy Phase II RFI/RI objectives, to be sufficiently lacking in technical merit and strategic planning to not allow approval of this draft version Substantive comments from the Division, EPA, and its subcontractor detail the document's shortcomings

Changes to the Revised Work Plan are likely to be resolved more quickly and easily than the sections containing the results of the Phase I RFI/RI We are willing to split the final approvals of the entire document to separate the Sampling and Analysis Plan from the Phase I Report This will allow DOE to begin approved fieldwork this season while the Phase I Report is being concurrently revised

Meetings among DOE, EG&G, EPA, and CDH staff have already been scheduled to resolve agency comments Although the comments are extensive, we do not feel their resolution should adversely impact the implementation of the Process Improvement Proposal all parties have informally agreed to IAG milestones related to the OU7 closure still need to be settled among the parties

If you have any questions regarding these matters, please call Dave Norbury of my staff at 692-3415

Sincerely,

Joe Schieffelin

Joe Schieffelin, Unit Leader
Rocky Flats IAG Unit
Hazardous Waste Control Program

cc Arturo Duran, EPA
Jen Pepe, DOE
[redacted]ght, EG&G
Laura Perrault, AGO
Steve Tarlton, RFPU

ADMIN RECORD

BZ-A-000457

Colorado Department of Health
Comments on Technical Memorandum/Revised Work Plan
OU7

General Comments

1) Substantial effort is given to site-to-background statistical comparisons for the purposes of selecting Potential Contaminants of Concern (PCOCs) Due to the nature of the OU7 closure, much of this is superfluous The landfill proper will be closed using a presumptive remedy, rendering PCOC selection unnecessary Decisions regarding surface- and ground-water will be based on comparing analyte concentrations to ARARs The leachate seep is a F039 listed hazardous waste and must be managed accordingly The only OU7 areas where decisions will be risk-based, and require PCOCs/COCs for that purpose, are the sediments and soils

2) The data sets used for two of the critical site-to-background comparisons are not appropriate The Division has previously emphasized that use of surficial soils background data from Rock Creek is limited to OUs 1 & 2 The agencies recently granted approval to DOE's *Background Soils Characterization Program Work Plan,* validated data from this effort may be available as early as this fall Additionally, the use of stream sediments as a background against which to compare the East Landfill Pond (ELP) sediments is geologically improper

If a site-to-background statistical comparison of surficial soils and sediments will drive any decisions at OU7, DOE must use approved background data However, we will not allow continued use of OU1 and OU2 data for all subsequent OUs, particularly now that a surface soil background program has been approved DOE has also failed to collect representative background for reservoir sediments This has sitewide significance and affects at least OUs 3, 5, 6, and 7

This leaves several options i) wait until suitable background data sets are available, ii) omit the statistical background comparison altogether and proceed with all analytes through the remainder of the COC selection process, or iii) assume that, based on current analyses presented in the TM showing several analytes over draft PRGs, both the East Landfill Pond surface soils and sediments will require action and include them in the presumptive closure design for the landfill We recommend that DOE proceed with options ii) and iii) for the sediments and option i) for the surface soils

3) Implications of subsurface contamination upgradient of the landfill and both surface/subsurface contamination downgradient of the East Landfill Pond are largely ignored The text mentions their existence but stops short of envisioning options If upgradient contamination from another source not characterized in any other investigation has crossed the OU7 boundary, it remains OU7's responsibility to manage any risk from that contamination

Specific Comments

1) Table 2-6 lists the geometric mean for the hydraulic conductivity of "Disturbed Alluvium & Fill Material" (artificial fill) as 4 37 cm/sec This appears to be missing the corresponding power of ten notation

2) The following three comments relate to ELP surface soils and the larger issue of background

All but one of the 17 PCOCs for ELP surface soils failed the hot measurement test (Table 4-13) However, the results of all of the comparisons are not provided The Appendix M data disk only contains hot measurement test results for groundwater For example, because one data point for americium-241 is 26 6 times larger than the corresponding (Rock Creek) $UTL_{99/99}$, it would be informative to look at the plutonium-239/240 value at the same location This is not possible without the data

The $UTL_{99/99}$ values presented in Table 4-14 do not fully agree with the values from Table 3-9 of the *Background Soils Characterization Program Work Plan* (Metals Concentrations in Surface Soils from the Rock Creek Study) Specifically, the values for calcium, magnesium, selenium, sodium, vanadium, and zinc in Table 4-14 are higher than those in the reference document This brings the validity of the remaining $UTL_{99/99}$ values that were not presented in Table 4-14 into question

Figures 4-17 through 4-27, depicting the extent of surface soil contamination, reference the *Background Geochemical Characterization Report for 1992* The correct version of this report is the final submittal, dated September 1993, and to the Division's knowledge, does not contain surface soil data from 0 to 2 inches We were unable to verify the $UTL_{99/99}$ values presented on these Figures

This discussion needs to correctly and consistently identify the data sources AND provide ALL relevant data to allow confirmation of the conclusions

3) Section 4 4 2, Bedrock Geologic Materials The Division is reticent to accept the argument that high strontium concentrations (or any other analyte failing the statistical tests) is due to differences in the types of geological materials instead of the presence of contamination This undermines the whole purpose of the background comparison In such a case the analyte should be carried through the remainder of the COC selection process

4) Section 4 7.2, VOC Distribution in Groundwater The "total VOC" approach presented may be helpful to describe the spatial extent of VOCs in groundwater but will have no bearing on remedial decisions for this media.

5) Sections 4 7 3 and 4 7 4 The discussion of the nature and extent of contamination in UHSU/LHSU groundwaters is lacking any mention of metals

6) Table 4-2 Why is the volume of compacted trash for the years 1987-1991 almost triple the volume of all other years?

7) Section 5 4, DQOs for ELP Sediments and Adjacent Soils

The text states that the information required to make a decision includes estimates of the risk to human health and the environment (i e a "focused" risk assessment), that sources for each item of information have been identified, and that sufficient data have been collected to make decisions about the need for remediation It goes on to say that the number of surface soil samples collected during the Phase I RFI/RI far exceed the minimum required to support the DQOs Nevertheless, additional samples are recommended

The Division does not understand why verification samples at locations exceeding the $UTL_{99/99}$ are necessary The Phase I data is validated and fully useable - why repeat the effort? Defining the spatial delineation of hotspots may be needed, but resampling the same locations for verification purposes seems needless

Are three samples sufficient to adequately characterize the sediment? Most statistical literature considers a sample size of eight to be a minimum

8) Section 5 5, DQOs for Groundwater and Surface Water The decision to remediate organics cannot be based on the analysis presented in Section 4 7 The "total VOC" discussion qualitatively describes nature and extent, however, there are no ARARs for total VOCs, and as such, has no basis in remedial decisions

9) Section 5 6, DQOs for the Landfill Conflicting statements exist regarding the disposition of leachate Section 5 6 2 says leachate collection is not required if concentrations do not exceed chemical-specific ARARs, Section 5 6 5 says containment, control, and treatment of leachate is a component of the presumptive remedy The text needs to be changed to reflect a consistent strategy The Division endorses the latter approach

10) Section 6 2, Surface Soils As previously noted, the Division does not support the need for confirmatory sampling Omitting this duplicative step would significantly reduce costs associated with Phase II fieldwork Delineating the area of soil contamination, to the extent the Phase I data has gaps, is acceptable

11) Section 6 3, Groundwater

The Division questions objective (1) for the additional monitoring wells Section 2 presents a strong argument that the groundwater collection and diversion systems on the north side of the landfill have failed Add to this the fact that landfilled waste has extended beyond the intercept system, implying any new system would need to be outside the edge of waste, makes determining the adequacy of the existing system unimportant The location of these proposed wells is also missing from Figure 6-3

The two proposed wells north and south of the ELP are very close (perhaps 250 feet) to existing wells 7187 and B206689, respectively, and are to be screened in the same intervals as the existing wells Will these proposed locations really tell us anything the existing wells cannot?

12) Section 6 4, Landfill Cap Design What is the purpose of collecting 27 samples of the existing soil cover? This will all be under the cap Load bearing capability of this foundation layer is needed but can be determined with fewer samples

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

JUN 30 1994

Ref: 8HWM-FF

Mr. Gary Baughman
Hazardous Waste Facilities Unit Leader
Colorado Department of Health
4300 Cherry Creek Drive South
Denver, CO 80222-1530

SUBJECT: Comments on OU 7 TM, Revised Workplan

Dear Mr. Baughman:

The purpose of this letter is to transmit EPA's comments and those of our contractor (PRC) on the subject document.

In general, EPA feels that the TM needs to undergo extensive revision and recommends that CDH withhold approval until the TM is properly revised according to the attached comments. In order for DOE to obtain a faster approval from the regulatory agencies on the phase II field work, DOE should revise and resubmit the field sampling plan (FSP) as soon as possible. Other sections of the TM which were impacted by the comments could be revised at a later time. In this manner, new investigation efforts can be implemented sooner.

Please do not hesitate to contact Arturo Duran of my staff at 294-1080 with any questions or comments you may have.

Sincerely,

Bonita Lavelle
for Martin Hestmark, Manager
Rocky Flats Project

Enclosures
cc: Jessie Roberson, DOE
Jen Pepe, DOE
Joe Schieffelin, CDH
Dave Norbury, CDH
Arturo Duran, EPA

EPA's Comments on the OU 7 TM
Revised Workplan

General Comments

- The text states that the purpose of the proposed modified field sampling plan (FSP) is to gather information to support a risk assessment. The risk assessment is a useful tool to evaluate the site risks to determine whether or not an action is warranted for the site. In the case of OU 7, the Present Landfill, it has already been decided that an action needs to take place pursuant to closure requirements under RCRA. The current closure approach for OU 7 consists of a landfill cover based on the presumptive remedy. Therefore, a risk assessment is not required to justify the closure action. However, a risk assessment will be required to evaluate post-closure site risks.

- There are several inconsistencies throughout the text regarding the East Landfill Pond sediments. The text states in the executive summary that the sediments should be sampled in order to determine whether the sediments should be remediated or not. Later, in Section 5, page 5-11, it is stated that five out of the 12 potential contaminants of concern (PCOCs) for the sediments, based on previous sampling efforts, exceeded the TBC or PRG by at least one order of magnitude. The text further states that it is unlikely that additional data will affect the decision to remediate the pond sediments. The proposed FSP in this TM intends to take three additional samples from the pond sediments. Because the available data already support a decision to remediate the pond sediments, the need for further sampling solely for characterization purposes is questionable. EPA feels that further sampling of the pond sediments may be warranted to support the selection of a remedial technology or remedial strategies. For example, sediment sampling could be useful for the following purposes: to determine the total volume of sediments to be remediated, to perform contaminant leachability tests (TCLP), and to perform treatability studies. EPA suggests that proposed pond sediment sampling activities be revised in order to redefine the scope of the effort and its purposes.

- The Phase I RI report included in this TM failed to adequately evaluate the effectiveness of some physical structures such as slurry walls and interceptor trench systems installed around the OU 7 area. Specific comments regarding the effectiveness of these physical structures are detailed in the specific comments below and in PRC comments.

- The Phase I RI report also failed to evaluate the fate and transport of contaminants within the unsaturated zone. This is critical information for closing hazardous waste in place. Ground water impacts from sources of contamination left in place need to be fully evaluated and understood. In this manner, the appropriate cover design and post-closure care monitoring plan can be properly developed. This TM needs to include a detailed discussion on the behavior of the contaminants present in OU 7.

- Due to major flaws with the Phase I RI report, EPA is unable to determine whether there are any field data gaps within the OU 7 area. If it turns out that field data gaps exist after the TM is revised, then EPA will require additional field sampling activities to be performed.

Specific Comments

Section 2.5.4.1, Transect AA-AA': This section discusses transect BB-BB' instead of transect AA-AA'. This needs to be revised to refer to the appropriate location being discussed.

Section 2.5.4.1, Transect BB-BB'': North Side. Change to "Transect CC-C''."

Section 2.5.4.1, Transect CC-CC': South Side. The conclusion in this section that the interceptor trench system is effective in this location because of differences between the saturated thickness of both alluvial wells is not well supported. Differences in saturated thickness could be due to a slope area or any other lithology differences. It is not appropriate to rely only on the saturated thickness of the wells to evaluate the effectiveness of the interceptor trench system. In addition, looking at Table 2-7, the water-level elevation between the two wells is about the same (0.03 ft difference). This may be a good indication that the interceptor trench system is not effective. This section needs to be revised to provide better justification of the conclusion or the conclusion should be changed.

Section 2.5.4.1, Transect DD-DD': Evaluation Slurry Wall. This section states that based on the well hydrograph and isopach maps of well 6787 and 6887, ground water appears to be flowing over and/or through the slurry wall. Instead of concluding that the slurry wall is not effective at this location, the text argues that it is possible that the well pair was not properly positioned on either side of the slurry wall or that the slurry wall does not extend this far to the east. EPA feels that the relative location of wells from the slurry wall in question should be known. If the location of the slurry wall is unknown, then efforts to locate it using geophysical techniques should be performed. This section needs to be revised to provide better justification of the conclusion or the conclusion should be changed.

Transect EE-EE': Evaluation of the Slurry Wall. Change to "Transect DD-DD'."

Section 6.2, Surface Soils, page 6-2. The FSP proposes collecting 39 additional surficial soil samples at 34 hotspot locations identified from previous sampling efforts for confirmation purposes. EPA feels that in order to confirm adequacy of previous data, fewer surficial samples will be sufficient. EPA recommends that five samples be collected for confirmation purposes. If it is determined that surficial soil data gaps exist within the OU 7 or East Landfill Pond area, additional surficial soil samples may need to be taken.

Section 6.2.1, Proposed Field Sampling Activities. The text states that subsurface soil samples will be collected using the hand auger method outlined in Geotechnical SOP.08, Surface Soil Sampling (EG&G 1992c). This is inconsistent with Section 6.3.1 which suggests the use of a hollow-stem auger equipped for continuous core sampling in accordance with Geotechnical SOP.02. It appears that the wrong SOP is referenced in this case. The hand auger method is not appropriate for collection of subsurface soil samples. This section needs to be revised accordingly to include the appropriate drilling technique and respective SOP.

In addition, it is not clear whether subsurface soil samples will be collected for characterization purposes. EPA feels that it will be worthwhile to take advantage at each well location to collect subsurface soils during the drilling. In this manner, further delineation of the extent of contamination of the unsaturated soils can be assessed. EPA suggests that the FSP be revised to include subsurface soils collection and characterization. The appropriate analytical suite for subsurface soil sample analysis needs to be developed and included in this TM.

Section 6.3, Ground Water. EPA feels that the proposed eight well locations are adequate as a starting point to evaluate the three objectives outlined in the last paragraph of this page. EPA is concerned that the results of this sampling effort may suggest that additional sampling is required to fully evaluate the three objectives. If this turns out to be the case, then EPA will require additional sampling to be done. This section should include this possibility.

Section 6.4, Field Activities Related to Landfill Cap Design. EPA agrees that information on the physical properties of the soils and gas emission rates are useful for the selection of the landfill cap design. However, EPA feels that the evaluation of the appropriate landfill cap design for OU 7 may require additional information on the fate and transport of contaminants within the unsaturated zone. For example, contaminant leachability test columns, leachability transport models and TCLP analysis will provide crucial information to evaluate and select the appropriate cap design. EPA suggests that the scope of this section be expanded to include the above field activities. It is important to understand the behavior of contaminants present at OU 7 and their migration potential to ground water. One of the main objectives of the closure of OU 7 is to stop sources impacting ground water quality.

ROCKY FLATS PLANT
GOLDEN, COLORADO

TECHNICAL REVIEW
DRAFT FINAL
REVISED WORK PLAN FOR OPERABLE UNIT NO. 7

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 8, Federal Facilities Remedial Branch
Denver, Colorado

Work Assignment No	C08060
EPA Region	8
Site No	CO7890010526
Date Prepared	June 17, 1994
Contract No	68-W9-0009
PRC No	012-C08060
Prepared by	PRC Environmental Management, Inc (Jim Wulff, Darwin Nelson, Garry Farmer, Jean Barranco, Sue Hartley, Terry Ruiter)
Telephone No	303/295-1101
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Telephone No	303/294-1080

than TDS concentrations in groundwater inside the interceptor system The results of this statistical comparison, however, are used to draw conclusions other than to accept or reject the null hypothesis For instance, the analysis determined that TDS concentrations at well 71493, which is supposed to be located inside the interceptor system, are similar to TDS concentrations at wells 70093 and 71193, which are located outside the interceptor system Instead of rejecting the null hypothesis that TDS concentrations are different on either side of the interceptor system and concluding that the interceptor system is not effectively diverting groundwater at this location, the OU7 Revised Work Plan suggests that the results indicate that all three wells are located outside of the interceptor system Figure 2-40 shows that this part of the interceptor system is an inflow boundary (because it is not believed to be keyed into bedrock in this area), which would suggest groundwater inside the landfill at well 71493 is thoroughly mixed with groundwater from outside the landfill

This example highlights the major weakness of Section 2 0, that any analysis of the effectiveness of the groundwater intercept and diversion structures depends on first accurately locating the structures This could have been accomplished with various geophysical methods such as ground-penetrating radar The analyses of groundwater diversion structures' effectiveness should not be considered conclusive in areas where there is any doubt of their locations Groundwater analytical results should not be used to determine the locations of these structures

2 The groundwater flow velocities presented in Section 2 5 3 4 are questionable as a result of errors in quantifying input parameters, particularly in the area beneath and downgradient of the East Landfill Pond embankment Significant errors were made in the calculation of hydraulic gradient and the estimation of hydraulic conductivity, both of which are addressed in specific comments later in this report Indicative of the overall quality of this analysis is the assignment of a uniform range of effective porosity (0 1 to 0 2) for the entire range of subsurface materials at OU7, from unweathered claystone to landfill debris This section should be completely rewritten to provide estimated groundwater flow velocities that are supported by data If additional data are needed to fully characterize the area beneath and downgradient of the East Landfill Pond embankment, collection of these data should be incorporated into the Phase II field activities

3 A brief review of Section 2 6 7 revealed two conceptual errors with water balance components Vertical hydraulic gradients presented in Table 2-10 to support Section 2 6 7 7 include a gradient calculated from well pair 72393/72093 It is inappropriate to include this well pair in the calculation of the mean vertical hydraulic gradient from the fill to the weathered bedrock because both wells are screened in the fill material This may account for their anomalously low hydraulic gradient The discussion of the calculation of groundwater base flow to the East Landfill Pond in Section 2 6 7 8 states, " because most of the East Landfill Pond bottom is underlain by unweathered bedrock, the cross-sectional area of flow is defined by the depth of groundwater at the pond shoreline" (the difference between pond surface elevation and landfill seep elevation) Geologic cross-section G-G' (Figure 2-15) depicts weathered bedrock having a thickness of 15 feet below the pond, which is supported by logs of nearby bedrock wells 0886 and B206789 Therefore, the cross-sectional area should be the difference between seep elevation and the mean elevation of the pond bottom This statement and any related calculations should be corrected

The water balance itself is very difficult to understand The relationship of each of the components listed in the columns of Table 2-14 is not immediately apparent. Two different water balance equations are stated, one on page 2-40 and one on page 2-47 Neither equation can be used to calculate the monthly pond storages listed in column P To reproduce those numbers, the equation listed on page 2-47 must be used, discharge from the groundwater interception system must be added, and seepage from the landfill pond must be subtracted Equations used should be accurately and consistently referenced in the document to avoid confusion

Section 3.0 - Data Quality and Useability

4 The OU7 Revised Work Plan calculated an average relative percent difference (RPD) for each analyte group (such as metals) in each matrix that was sampled, and used this average to assess whether the precision of data for each analyte group (by matrix) was acceptable The RPD is a measurement of the precision of data and is evaluated by comparing analytical results for real samples with their associated duplicate samples The RPD for a matrix should be assessed in an individual analyte basis, not as an average for an analyte group As previously stated in the report, acceptable RPDs are less than 20 percent for all analytes in water (surface and ground) and less than 35 percent for all analytes in soil (surficial,

subsurface geologic material, and sediments) RPDs for individual analytes greater than these values are listed throughout Section 3 1.5 and are not within an acceptable range Therefore, all real data that correspond to this quality control (QC) result should be treated accordingly The precision criteria formulated for the contract laboratory program (CLP) and non-CLP method analyses should be followed

5 For sample pairs where a detectable result is reported for one sample and a non-detect result qualifier is reported for another, the RPDs were calculated by substituting the detection limits for the nondetected results When evaluating a nondetected value, it is inappropriate to assume that value to be the detection limit The RPD is expressed as

$$RPD = \frac{(R - D)}{\left[\frac{(R + D)}{2}\right] x\ 100}$$

R = the concentration of the analyte in the real sample

D = the concentration of the analyte in the duplicate sample

Therefore, if D is less than the detection limit, it is improper to assume that value to be the detection limit Standard practice for the calculation of an RPD where a compound is not detected is to assign one-half the detection limit as the concentration

Section 4.0 - Nature and Extent of Contamination

6 Overall, the statistical analysis procedures used for background comparison as outlined in this section are consistent with those recommended by Dr Gilbert (Gilbert 1993) and required for selection of chemicals of concern (COCs) at Rocky Flats However, distinction between which inferential statistical tests were used to support the selection of the contaminant as a preliminary chemicals of concern (PCOC) should be provided in the text If the chemical passes only one inferential statistical test, it must be retained as a PCOC.

Typically, PCOCs were selected in the risk assessment, not in a sampling and analysis plan The text should provide justification and rationale for carrying out the PCOC selection process independent of the risk assessment and prior to sampling

Due to time constraints, statistical calculations could not be verified It was assumed that all statistics were calculated correctly

7 The work plan indicates that East Landfill Pond sediments will require remediation, because analytical results from sediment samples exceed five PCOCs by an order of magnitude or greater The accumulation of contaminants in the pond sediments suggests a lack of contaminant mobility within this environment Furthermore, the pond provides a system for the natural attenuation of organic contaminants contained in the landfill leachate Thus, the pond functions as a collection system for the leachate and as a primary treatment system for organic contaminants Because leachate collection may be an integral component of the presumptive remedy for CERCLA municipal landfill sites (EPA 1993), the East Landfill Pond should be replaced with a leachate central system if it is removed through remedial activities The OU7 revised work plan should discuss remediation of the East Landfill Pond in greater detail, and describe how a leachate control system will be integrated into the landfill closure process

8 The results of volatile organic compound (VOC) analyses conducted on samples collected from the southern section of the landfill indicate that elevated levels of chlorinated hydrocarbons are present in the upper hydrostratigraphic unit Although these compounds may originate at another operable unit, they may affect the landfill and the selection of landfill remedial strategies Therefore, the work plan should include the installation and sampling of additional wells to identify the extent of the chlorinated VOC contamination In addition, existing wells in this area may require sampling and analysis for VOCs to accurately delineate the extent of the chlorinated VOC contamination

9 The use of averaged concentrations over a 3-year period to evaluate the nature and extent of landfill contaminants is inappropriate Averaging several years of data provides a false indication of the extent and type of contamination that is currently present at OU7 This approach may potentially obscure high and low concentrations, and does not provide accurate information on the locations and concentrations present in the environment Each year of data should be averaged and isoconcentration maps prepared from these results Presented in this fashion, the three sets of data may indicate trends in the transport and fate also the future extent of the contamination

Section 5.0 - Data Quality Objectives

10 Section 5 discusses the data quality objectives (DQOs) associated with the investigation of the landfill and identifies the number of samples required to delineate the nature and extent of contamination for each media, sediments, groundwater, and the landfill However, it is not clear from the text in Section 6 (Sampling and Analysis Plan) how this information was used to determine the recommended number of samples to be collected during the additional investigation The rationale used during the investigation of the DQO process and the sampling design must be clearly presented

Appendix J, Data Quality Tables

11 Data in Tables J-11 through J-13 are presented in a format that is not consistent with the discussion of data quality in the text or consistent with other tables in the appendix The text and the other tables present data organized primarily by analyte type (metals, radionuclides) Tables J-11 through J-13 group all analyte types together, and list all compounds in alphabetical order, with analytes that have numerical prefixes preceding all other analytes Tables J-11 through J-13 should be reformatted to match the text and other tables

3.0 SPECIFIC COMMENTS

1 Page 2-20, Paragraph 3 The text states, "groundwater in the upper hydrostratigraphic unit (UHSU) generally flows to the east, but is diverted around the landfill by way of the groundwater intercept system " However, Figure 2-40 shows that groundwater passes beneath the intercept system along the northwestern boundary of the landfill There is also some question as to whether the slurry walls effectively divert water away from the landfill This statement should be revised to be consistent with the conclusions stated elsewhere in the text

2 Page 2-28, Paragraph 1 The text specifies an average horizontal groundwater gradient through the surficial materials at the East Landfill Pond embankment that is calculated from water levels at wells TH04742 and 4187 Well 4187 is screened across an unweathered sandstone at a depth of 81 to 94 feet and should be considered part of the lower hydrostratigraphic unit (LHSU), whereas well TH04742 is screened across artificial fill

(embankment material) and subcropping, weathered sandstone This well should be considered to be screened in the UHSU Geologic cross-section G-G' (Figure 2-15) also depicts groundwater in well 4187 as having a different (about 70 feet lower) potentiometric surface than well TH047492 Therefore, well 4187 should not be used to calculate hydraulic gradients in surficial materials, or in the UHSU Wells TH047292 and TH047492, both of which are screened across artificial fill and subcropping, weathered bedrock, should be used to calculate the UHSU hydraulic gradient instead

3 <u>Page 2-28, Paragraph 2</u> This paragraph provides average linear groundwater flow velocities in weathered bedrock along three flow paths, one of which is below the East Landfill Pond embankment, between wells TH047492 and 4187 The input parameters for this calculation include a geometric mean hydraulic conductivity value of 4 37 x 10^{-7} centimeters per second (cm/sec) estimated using drawdown recovery test data from wells 70193 and 70493 Wells 70193 and 70493 are both screened in claystone and clayey siltstone, whereas well TH047492 is screened in sandstone Therefore, the hydraulic conductivity value derived from wells 70193 and 70493 is inappropriate to use for the area beneath the East Landfill Pond embankment, which is underlain, at least in part, by sandstone The phase II field investigation should include a drawdown recovery test in the weathered sandstone beneath or adjacent to the East Landfill Pond embankment, either in well TH047492 or in a new well that is screened in sandstone

4 <u>Page 2-31, Paragraph 2</u> This paragraph discusses the effectiveness of the south slurry wall at diverting water away from the landfill Hydrograph EE-EE' (Figure 2-36) is cited as an indication that the slurry wall is diverting water from the landfill because water levels are 2 to 6 feet lower on the north (downgradient) side of the wall. The paragraph also cites the potentiometric (Figures 2-21 through 2-24) and isopach (Figures 2-29 and 2-30) maps as supporting this interpretation because they show lower water levels north of the wall However, the isopach and potentiometric maps also show a large unsaturated area east of the wall, which is in a downgradient direction beyond the end of the wall. Groundwater should be diverted to this area if the wall is functioning properly This paragraph should discuss the presence of this large unsaturated area, and the implications that this unsaturated area may have on the evaluation of the south slurry wall's effectiveness.

5 Page 2-50, Paragraph 3 The text states that western wheatgrass is both the dominant graminoid in the mesic mixed grassland community of OU7, yet also describes it as a species present in lesser amounts than a dominant species The text should be clarified to indicate the correct category for western wheatgrass

6 Page 2-51, Paragraph 3. The text states that the disturbed community included 27 species, of which seven were grasses, 18 were forbs, and two were subshrubs. The text then states that the only shrub present was wild tarragon Fringed sage is included with forbs. It is not clear what species were considered to be subshrubs or what criteria were used to distinguish shrubs and subshrubs The text should be clarified to describe the criteria used to distinguish the components of the disturbed community, and to identify the species included in each

7 Pages 2-52 and 2-53. The text discusses wildlife surveys undertaken at Rocky Flats but cites only the environmental impact statement (EIS) produced in 1980 It is not clear whether the majority of the text is based on the EIS or on more recent studies Because more recent data exist, a 14-year-old EIS report based on older data should not be used as the primary source of information on the site The most recent data should be used

8 Figure 2-40. The analysis of groundwater levels at well pair 6787/6887 (pages 2-30 and 2-31) concludes that "groundwater appears to be flowing over and/or through the slurry wall " Figure 2-40, which depicts groundwater inflow and outflow boundaries of the landfill, should be revised to reflect this conclusion Water balance calculations in Section 2 6 7 should also be revised to reflect the longer inflow boundary

9 Figure 2-42 The figure indicates that two locations in the pond were sampled for water and sediment toxicity studies The results of those studies were not provided in the discussion of ecological data provided in the text These results should be discussed.

10 Table 2-9 This table summarizes lateral (horizontal) hydraulic gradients that were calculated for surficial materials and weathered bedrock The hydraulic gradient values are questionable for a number of reasons Horizontal hydraulic gradient is defined as a change in head from one well to another well divided by the horizontal distance between the two wells Therefore, it is impossible that two different horizontal hydraulic gradients representing two different geologic units could be calculated between the same two well screens, as has been done for

each pair of wells listed in the table Furthermore, hydraulic gradients in weathered bedrock are provided for each well pair even though five of the six wells are screened in surficial materials The only well screened in bedrock is screened in the LHSU and should not be included in this analysis of UHSU hydraulic gradients Horizontal hydraulic gradients should be recalculated in a manner that makes sense hydrogeologically, and raw data (water level measurements and their dates) should be included with the table Furthermore, this analysis would be less confusing if the wells were divided primarily by hydrostratigraphic unit rather than by geologic unit, because some wells are screened across two geologic units.

11 Figure 2-8 The groundwater intercept system is depicted in Figure 2-8 as consisting of perforated pipe along the entire length of the system This depiction contradicts all of the other figures, which show the perforated section extending only to, or slightly beyond, the western ends of the north and south slurry walls The figure should be corrected to accurately depict the perforated section of the groundwater intercept system

12 Figure 2-13 Text and figures are not consistent regarding the location of well B106089 relative to the groundwater intercept system Well B106089 is clearly depicted as being inside the groundwater intercept system on geologic cross-section E-E' (Figure 2-13) and on all of the potentiometric and isopach maps However, hydrograph FF-FF' (Figure 2-37) states that well B106089 is located outside the groundwater intercept system The text on page 2-29 (which discusses hydrograph FF-FF') and page 2-34 (which discusses the evaluation of the leachate control system) also indicates that well B106089 is outside the groundwater intercept system Figures and text should be revised to be consistent If the location of well B106089 relative to the groundwater intercept system is not known with certainty, it should be clearly stated in the text.

13 Figures 2-29 and 2-30 The two isopach (saturated thickness of surficial materials) maps are poorly drawn and may lead to errors in the calculation of landfill leachate volume The most prominent feature on these maps is a groundwater mound that is greater than 20 feet thick at wells 72093 and 72393 in the center of the landfill This mound extends from the area northwest of the landfill, where the groundwater intercept system is not keyed into bedrock, and terminates abruptly beyond this well pair The only data points in the downgradient direction within the landfill are well pair 72293/72493, where the saturated thickness is about 2 5 feet The bedrock topography map (Figure 2-17) shows that this well pair is situated on a

bedrock ridge (interfluve) and that a channel incised into the bedrock surface probably leads from well pair 72093/72393 to cone petrometer test (CPT) point 01493 to a location at or slightly north of CPT point 02293 and then below the East Landfill Pond This channel passes north of well pair 72293/72493, which may be the reason that the saturated thickness is only 2 5 feet at this location Given the bedrock surface depicted in Figure 2-17, the most logical interpretation would be that groundwater below well pair 72093/72393 will follow the incised channel surface down to East Landfill Pond, forming a complete groundwater/leachate pathway to the pond This interpretation would be consistent with the statement on page 2-20 of the text " in the incised stream valley, groundwater flows toward the drainage or the East Landfill Pond, following the topography " Figures 2-29 and 2-30 should be revised to be consistent with this interpretation Calculations of landfill leachate volume should also be revised to be consistent with this interpretation

14 Section 3 1 6 This section discusses the accuracy of the OU7 data Accuracy measures the bias in a measurement system Bias is defined as

$$\%B = 100 - \%R$$

$\%R$ = the percent recovery of a spike of a known analyte

Accuracy was measured only for the dissolved and total metals of groundwater samples All matrices and analytes should be assessed for accuracy to fulfill the DQOs

15 Table 3-2 Table 3-2 summarizes the actual QC samples collected at OU7 There are discrepancies between the required frequency of QC samples (Table 3-1) and the actual QC samples collected For example, of the 48 real soil gas samples collected at IHSS 203, only two field duplicate samples were collected The required frequency of field duplicates as stated in Table 3-1 is one duplicate per 10 real samples or one duplicate per sampling event (whichever is more frequent) Therefore, the required QC sample criterion was not met

16 Section 3.1.2 2, Page 3-4, Third Paragraph, and Table 3-5 This section discusses the results of the data validation These results are presented in Table 3-5 Discrepancies exit between the table and the discussion on page 3-4 For example, the percent results rejected (%R) of subsurface geologic material analyzed for radionuclides was calculated as 8%R This value is

really 10%R Also, this section states that 72 percent of groundwater data were validated This value was recalculated to be 55 percent. The values in this section should be recalculated for accurate results, and the text and tables corrected to be consistent

17 Section 3 1 5.4, Page 3-12, Third Paragraph The RPDs were not calculated for VOCs in subsurface geologic material duplicate sample pairs When assessing the data quality and usability, it is important to evaluate the precision of the data Without the RPD, an overall assessment of precision is impossible RPDs should be calculated and reported for all analyses on all matrices

18 Section 3 1 7.1, Page 3-23, Third Paragraph This section concludes that based on the frequency of detection and concentrations detected in equipment rinsates, the data are well represented However, Table J-9 presented analytes (for example, trichloroethylene [TCE]) that were detected in every equipment rinsate Therefore, the statement that the data are well represented based on the frequency of detection is unfounded This should be corrected to state that the frequency of detection and concentrations of analytes in equipment rinsates may have affected the representativeness of soil gas samples

19 Section 3 1 7 3, Page 3-23, Fifth Paragraph This section states that the metals detected in the equipment rinsates were "most likely" present in the distilled water (source water) used to rinse the equipment The source water used for equipment rinsates should be analyzed and reported so that data support this statement

20 Sections 3.1.7.3 through 3.1 7.7 These sections discuss the representativeness of the data Representativeness is analyzed with results from the equipment rinsates Inaccurate equipment rinsate data are presented For example, Section 3 1 7 4 states that 10 equipment rinsates were collected However, corresponding Table J-12 shows that many analytes are not represented 10 times All statements presented in the text should be supported by correct data in the tables

21 Section 3.1 8, Page 3-30, Third Paragraph The second sentence states that analytical data for soil gas did not meet the target 90-percent completeness goal The third sentence claims that the soil gas analytical data exceeded the 100-percent completeness goal These are

conflicting statements The percent completeness for soil gas needs to be reassessed and consistently reported

22 Section 3 1.8, Page 3-31, Second Paragraph Section 3 1 8 discusses completeness, which is represented in Table 3-5 As previously stated in specific comment number 16, discrepancies exist throughout Table 3-5 Therefore, Section 3 1 8 needs to be reassessed after Table 3-5 is reevaluated

23 Section 4 1, Page 4-1, Second Paragraph The text states that histograms and box-and-whisker plots for each analyte from each medium were generated for both site and background data Gilbert (1993) recommends that probability plots also be generated in order to determine the distribution of the data (that is, lognormal, normal, Weibull, or gamma) At a minimum, the text should describe how the distribution of the data was determined Knowing the distribution of the data helps to select the optimum statistical test

24 Page 4-5, Second Paragraph The text states that the hot-measurement test will compare each measurement to a corresponding upper tolerance limit $(UTL)_{99/99}$ value The computed 99-percent UTL ($UTL_{99/99}$) is such that one is 99-percent confident the UTL is equal to or greater than the true 99th percentile of the population of background measurements Gilbert (1993) recommends the use of a $UTL_{95/95}$ value The result of using the $UTL_{99/99}$ is a larger false negative error rate (that is, measurements from contaminated OUs would not be flagged) In other words, the use of a $UTL_{99/99}$ increases the possibility of eliminating a chemical as a PCOC based on background comparison when it is actually above background This type of error should be minimized to the extent possible An explanation of why the $UTL_{99/99}$ rather than the $UTL_{95/95}$ was used and the potential outcome of using this criterion should be provided for the reader

25 Page 4-24, Second Paragraph The text states that the activity of americium-241 in one surface water sample from location SW098 exceeded the $UTL_{99/99}$ value According to Table 4-20, it appears that uranium-235 and americium-238 also exceed their corresponding $UTL_{99/99}$ values The text should be corrected to be consistent with the table

26 Page 4-25, Second Paragraph The text states that Table 4-20 lists six VOCs and one semivolatile organic compound (SVOC) as PCOCs Table 4-20 presents four VOCs and two SVOCs as PCOCs The text should be corrected to be consistent with the table

27 Page 4-27, Third and Fourth Paragraphs These sections state that total VOC concentrations were estimated by summing the concentrations of the most frequently detected VOCs at OU7 This procedure is not typically performed in risk assessments and is not consistent with current Risk Assessment Guidance for Superfund (RAGS) EPA 1989) The text should describe how this information will be used in the risk assessment

28 Page 4-35, Fifth Paragraph The text states that methylene chloride and acetone were detected in laboratory blanks RAGS states that common laboratory contaminants may not be eliminated from the COC selection process unless they are less than 10 times the contaminant concentration in the blank sample The text should provide this information and these chemicals should not be eliminated unless they are less than 10 times the concentration in the laboratory blank

29 Page 4-27, Paragraph 3 The use of "total" VOC concentrations to evaluate the nature and extent of VOC contamination is not appropriate The nature and extent should be evaluated for individual constituents or groups of similar compounds (such as chlorinated VOCs) The text should be modified to include this evaluation

30 Page 5-11, Paragraph 1 The text concludes that two sediment samples collected from the East Landfill Pond are sufficient to characterize the extent of contamination in East Landfill Pond sediment This conclusion is based on a calculation using an equation presented in Section 5 4 7. However, the variance used in this calculation was determined from the analysis of three samples In general, analytical results from three samples is not considered sufficient to provide an accurate estimate of variance Therefore, additional sampling of the East Landfill Pond sediments is necessary to determine the nature and extent of contamination in pond sediments The additional data would also be useful in assessing the fate and transport of contaminants entering the pond and in determining the remediation potential of the system (see general comment 7)

31 Section 5 6.3, Page 5-22, Item 1 The first item of this paragraph lists types of data needed for landfill cap design, but does not address future landfill settlement An effort should be made to predict future settlement of the landfill Differential settlement will occur across the site based on the overall thickness and age of the waste, moisture content, and type of waste The design of the landfill cap or post-closure maintenance of the cap will be affected by the overall settlement Evaluation of the settlement prior to design will provide a more realistic and functional cap design or post-closure maintenance program

32 Section 5 6 3, Page 5-22, Item 2 The second item of this paragraph lists information needed for leachate control, but does not address migration of upgradient groundwater through or beneath the groundwater diversion system and into the landfill Further evaluation or discussion of the existing leachate control/groundwater diversion systems should be included to assess their impact on the volume and rate of leachate generated

33 Section 5.6 5, Page 5-25, Decision Route 4 Landfill gas control is typically necessary to ensure cap integrity and meet potential air emission applicable and relevant or appropriate requirements (ARARs) If gas treatment is not necessary based on ARARs, gas control should still be considered to ensure cap integrity and potential gas migration problems The text should be modified to address potential gas migration problems

34 Section 6 4, Page 6-14 This section presents the methodology for collecting samples to determine the physical properties of the interim soil cover It is assumed that this determination will be used to evaluate the appropriateness of the interim soil cover as a final cover or as a structural base for the final cover The text should be modified to clearly support this assumption

The procedures state that the samples will be collected from the upper 2 inches of the cover This appears to be inadequate to evaluate the properties of the interim cover Samples that represent the entire profile of the interim soil cover would be more appropriate The stability or structural quality of the soil will also be based on the stability of the refuse The decomposition or consolidation potential of the refuse should also be determined to evaluate final cover options (see specific comment number 31)

Additionally, physical properties of the soil are being evaluated Therefore, procedures related to collection of samples for chemical analysis (such as equipment rinse blanks and decontamination) are not necessary and should be deleted from the discussion

35 Page 6-4, Paragraph 4 This paragraph proposes eight additional monitoring wells to meet three objectives, one of which is to evaluate the effectiveness of the groundwater intercept system However, no action is proposed to close the gap in data for the north slurry wall The slurry wall should be accurately located relative to well pair 6787/6887 If it is determined that the well pair straddles the slurry wall, it should be concluded that the slurry wall is ineffective and that groundwater recharges the landfill along this boundary Water balance calculations, leachate volume calculations, and inputs to the Hydrologic Evaluation of Landfill Performance (HELP) model should be revised accordingly If it is determined that the well pair does not straddle the slurry wall, a monitoring well should be installed on the opposite side of the wall from the well pair at this location

36 Page 6-12, Paragraph 1 The discussion on drawdown recovery testing states that the test will be started immediately after the last bailer of water is removed from the well The test should be more accurate if it is started the instant the bailer is lifted above the water level in the well

37 Figure 6-3 The well pair that is to be drilled astride the north groundwater intercept system is not depicted on this figure showing proposed phase II monitoring well locations These wells should be added to the figure

38 Section 7-1, Page 7-1, Second Paragraph This paragraph discusses the list of field QC samples collected at OU7. Matrix spike (MS) and matrix spike duplicates (MSD) are not included in this list MS/MSD samples are collected in the field at the time of sampling and are used to evaluate analytical precision and accuracy MS/MSD is a routine application of QC procedures for controlling the reliability and defensibility of data collected MS/MSDs should be included in the field QC program and discussed in this section

39 Section 7-1, Page 7-1, Sixth Paragraph This paragraph states that trip blanks will accompany each shipment of water samples for VOC analysis Trip blanks are used to assess sources of contamination and cross contamination and their impact on data quality Trip blanks should

accompany all matrices that receive VOC analysis, including water samples The sampling program and the text should be modified to include trip blanks with all VOC samples collected

40 Section 7 2, Page 7-2, Second Paragraph This paragraph states that QC procedures for non-CLP methods will be developed as needed QC procedures should be addressed prior to sampling and analysis All analytical methods and QC procedures should be discussed in the revised work plan

41 Section 7 3.2, Page 7-3, Second Paragraph This section states that accuracy is expressed as a %R of a spike Accuracy is not only the assessment of the %R but also evaluation of field and trip blanks Accuracy measures the bias of the sampling and analytical procedures and all appropriate QC samples should be evaluated and described in the revised work plan

4.0 CONCLUSION

The OU7 Revised Work Plan has three significant problems (1) the site hydrogeology is poorly characterized, (2) the analysis of data quality and useability is incomplete and deviates frequently from standard practices, and (3) it is not clear from the text how the presumptive remedy will be implemented and whether enough data will be collected to assure efficient operation and maintenance of the closed landfill

Most of the problems with the hydrogeologic characterization can be attributed to uncertainty in the location of landfill structures Broad assumptions regarding the effectiveness of the groundwater diversion/leachate control systems and slurry walls are incorporated into the water balance and the calculations of leachate volume, and ultimately will be incorporated into the modeling of leachate flow rate These assumptions and data gaps would be reduced if landfill structures were accurately located In addition, poor application of basic hydrogeologic principles is evident in the calculation of hydraulic gradients The presentation of the water balance is unfocused and confusing and does not appear to be linked to a site conceptual model

The data quality analysis often deviates from established practices or is inconsistently applied to different analyte groups A more thorough data quality analysis should be performed, other sections of the report may then have to be revised, depending on the results of the analysis

The presumptive remedy is not presented in sufficient detail to ascertain whether significant issues in the operation and maintenance of the presumptive remedy, such as landfill settlement and gas control to ensure cap integrity, will be addressed Furthermore, it is never explicitly stated whether the existing landfill boundary structures (groundwater collection/leachate control systems and slurry walls) are to be incorporated into the design and whether they will require any upgrading Finally, the remediation of the East Landfill Pond should be discussed in more detail, particularly regarding how leachate control will be handled if the pond is significantly altered during remediation

5.0 REFERENCES

Gilbert, R C 1993. Letter Report to Beverly Ramsey, Systematic Management Services, Inc

U S Environmental Protection Agency (EPA) 1989 Risk Assessment Guidance for Superfund (RAGS) Office of Emergency and Remedial Response. EPA/540/1-89/002 December

EPA 1993 Presumptive Remedy for CERCLA Municipal Landfill Sites Office of Solid Waste and Emergency Response ERA/540/F-93/035 September